

**PATENT APPLICATION**  
**Theodore Robert Whitney**

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Appendix 1

Other References Cited

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18. U. S. Patent 5,227,839, Paul C. Allen, dated July 13, 1993, "*Small Field Scanner*"
19. U. S. Patent 5,285,236, Kanti Jain, dated Feb. 8, 1994, "*Large-Area High-Throughput, High-Resolution Projection Imaging System*"
20. U. S. Patent 5,329,332, David A. Markle et al, dated July 12, 1994, "*System for Achieving a Parallel Relationship Between Surfaces of Wafer and Reticle or Half-Field Dyson Stepper*"
21. "A Large Flat Panel Printer", T. R. Whitney, presented to the Society for Imaging Science and Technology 49<sup>th</sup> Annual Conference May 19-24, 1996
22. U. S. Patent 5,530,516, Ronald E. Sheets, dated June 25, 1996, "*Large-Area Projection Exposure System*"
23. U. S. Patent 5,559,629, Ronald E. Sheets et al, dated Sept. 24, 1996, "*Unit Magnification Projection System and Method*"
24. U. S. Patent 5,585,972, David A. Markle, dated Dec. 17, 1996, "*Arbitrarily Wide Lens Array with an Image Field to Span the Width of a Substrate*"
25. U. S. Patent 5,652,645, Kanti Jain, dated July 29, 1997, "*High-Throughput, High-Resolution, Projection Patterning System for Large, Flexible Roll-Fed, Electronic-Module Substrates*"
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TABLE 1A

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RLE
ID ALL MIRROR SYSTEM, 1X1REFLECT.006
ID1 F/NUM 3.449, COMPLETELY OFFNER SYSTEM
ID2 ALL SPHERES
ID3 ABOUT 18 INCHES BETWEEN FIELD CENTER LINES
ID4 ARCTUATE FIELD INSTALLED AS UAP 4,
ID5 122.29 MM. ARC RADIUS. FIELD WIDTH 1X30 MM.
WAVL .3650000 .4040000 .4380000
APS -22
GLOBAL
XPXT
UNITS MM
OBJ FINITE -0.24140259 4.00000000 15.00000000
REF HEIGHT -0.03500000 4.00003140 -0.03500000 15.00011774
MARGIN 1.270000
BEVEL 0.254001
0 AIR
1 CV 0.00000000000000 TH 0.00000000
1 -AIR
2 UAP 4 8
15.00000000 -0.54000000
8.00000000 0.54000000
-8.00000000 0.54000000
-15.00000000 -0.54000000
-15.00000000 -1.54000000
-8.00000000 -0.54000000
8.00000000 -0.54000000
15.00000000 -1.54000000
2 CV 0.00000000000000 TH 0.00000000
2 -AIR
3 CV 0.00000000000000 TH -80.00000000
3 -AIR
4 CV 0.00000000000000 TH 0.00000000
4 -AIR
5 CV 0.00000000000000 TH -59.90240000
5 -AIR
6 RAO 120.00000000 60.00000000 -10.00000000 0.00000000
6 CV 0.00000000000000 TH 0.00000000
6 AIR
6 DECEN 0.00000000 0.00000000 0.00000000 200
6 BT 45.00000092 0.00000000 200
6 EFILE EX1 31.270000 31.270000 31.524000 0.000000
6 EFILE EX2 31.270000 31.270000 0.000000
6 EFILE MIRROR -10.000000
7 CV 0.00000000000000 TH 0.00000000
7 AIR
7 DECEN 0.00000000 0.00000000 0.00000000 200
7 BT 45.00000092 0.00000000 200
8 CV 0.00000000000000 TH 0.00000000
8 AIR
9 CV 0.00000000000000 TH 0.00000000
9 AIR
10 CV 0.00000000000000 TH 122.29000000
10 AIR
10 DECEN 0.00000000 0.00000000 0.00000000 99
10 AT 0.00000000 0.00000000 99
11 RAO 120.00000000 120.00000000 0.00000000 -8.00000000
11 CV 0.00000000000000 TH 0.00000000
11 -AIR
11 DECEN 0.00000000 0.00000000 0.00000000 200
11 AT 45.00000107 0.00000000 200
11 EFILE EX1 61.270000 61.270000 61.524000 0.000000
11 EFILE EX2 61.270000 61.270000 0.000000
11 EFILE MIRROR 12.500000
12 CV 0.00000000000000 TH -442.33584756
12 -AIR
12 DECEN 0.00000000 0.00000000 0.00000000 200
12 AT 45.00000107 0.00000000 200
13 RAO 240.00000000 218.00000000 0.00000000 108.00000000
13 CV 0.0014062460552 TH 351.39880915

```

13	AIR					
13	DECEN	0.00000000	-108.00000000	0.00000000	200	
13	AT	0.00000000	0.00000000	200		
13	EFILE EX1	110.270000	110.270000	110.270000	0.000000	
13	EFILE EX2	110.270000	110.270000	0.000000		
13	EFILE MIRROR	-10.900000				
14	CV	0.00000000000000	TH	0.00000000		
14	AIR					
15	CV	0.00000000000000	TH	0.00000000		
15	AIR					
16	CV	0.00000000000000	TH	0.00000000		
16	AIR					
17	CV	0.00000000000000	TH	0.00000000		
17	AIR					
18	CV	0.00000000000000	TH	0.00000000		
18	AIR					
19	CV	0.00000000000000	TH	0.00000000		
19	AIR					
20	CV	0.00000000000000	TH	0.00000000		
20	AIR					
20	DECEN	0.00000000	0.00000000	0.00000000	1	
20	GT	90.00000000	0.00000000	1		
21	CV	0.00000000000000	TH	0.00000000		
21	AIR					
22	RAD	356.1697137266146	TH	0.00000000		
22	-AIR					
22	DC1	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
22	DC2	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
22	DC3	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
22	DECEN	0.00000000	0.00000000	0.00000000	99	
22	AT	0.00000000	0.00000000	99		
22	EFILE EX1	49.000000	50.000000	50.000000	0.000000	
22	EFILE EX2	49.000000	49.000000	0.000000		
22	EFILE MIRROR	12.500000				
23	CV	0.00000000000000	TH	0.00000000		
23	-AIR					
23	DECEN	0.00000000	0.00000000	0.00000000	1	
23	AT	0.00000000	0.00000000	1		
24	CV	0.00000000000000	TH	0.00000000		
24	-AIR					
25	CV	0.00000000000000	TH	0.00000000		
25	-AIR					
26	CV	0.00000000000000	TH	0.00000000		
26	-AIR					
27	CV	0.00000000000000	TH	0.00000000		
27	-AIR					
28	PTH -21	1.00000000	0.00000000			
28	CV	0.00000000000000				
28	-AIR					
29	PCV 21	1.00000000	0.00000000			
29	PTH -20	1.00000000	0.00000000			
29	PIN -20					
29	GID 'PICKUP '					
30	PCV 20	1.00000000	0.00000000			
30	PTH -19	1.00000000	0.00000000			
30	-AIR					
31	PCV 19	1.00000000	0.00000000			
31	PTH -18	1.00000000	0.00000000			
31	PIN -18					
31	GID 'PICKUP '					
32	PCV 18	1.00000000	0.00000000			
32	PTH -17	1.00000000	0.00000000			
32	-AIR					
33	PCV 17	1.00000000	0.00000000			
33	PTH -16	1.00000000	0.00000000			
33	PIN -16					
33	GID 'PICKUP '					
34	PCV 16	1.00000000	0.00000000			
34	PTH -15	1.00000000	0.00000000			
34	-AIR					
35	PCV 15	1.00000000	0.00000000			
35	PTH -14	1.00000000	0.00000000			

TABLE 1B

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35 PIN -14
35 GID 'PICKUP '
36 PCV 14 1.00000000 0.00000000
36 PTH -13 1.00000000 0.00000000
36 -AIR
37 PCV 13 1.00000000 0.00000000
37 RAO 240.00000000 218.00000000 0.00000000 -108.00000000
37 TH 462.33584756
37 AIR
37 EFILE EX1 110.270000 110.270000 110.524001 0.000000
37 EFILE EX2 110.270000 110.270000 0.000000
37 EFILE MIRROR -10.900000
38 RAO 120.00000000 120.00000000 0.00000000 8.00000000
38 CV 0.00000000000000 TH 0.00000000
38 -AIR
38 DECEN 0.00000000 -108.00000000 0.00000000 200
38 AT 45.00000106 0.00000000 200
38 EFILE EX1 61.270000 61.270000 61.524000 0.000000
38 EFILE EX2 61.270000 61.270000 0.000000
38 EFILE MIRROR 12.500000
39 CV 0.00000000000000 TH 0.00000000
39 -AIR
39 DECEN 0.00000000 0.00000000 0.00000000 200
39 AT 45.00000106 0.00000000 200
40 CV 0.00000000000000 TH 0.00000000
40 -AIR
41 CV 0.00000000000000 TH -122.29000000
41 -AIR
42 RAO 120.00000000 60.00000000 -10.00000000 0.00000000
42 CV 0.00000000000000 TH 0.00000000
42 AIR
42 DECEN 0.00000000 0.00000000 0.00000000 200
42 BT -45.00000092 0.00000000 200
42 EFILE EX1 31.270000 31.270000 31.524000 0.000000
42 EFILE EX2 31.270000 31.270000 0.000000
42 EFILE MIRROR -10.000000
43 CV 0.00000000000000 TH 59.90240000
43 AIR
43 DECEN 0.00000000 0.00000000 0.00000000 200
43 BT -45.00000092 0.00000000 200
44 CV 0.00000000000000 TH 0.00000000
44 AIR
45 CV 0.00000000000000 TH 0.00000000
45 AIR
46 CV 0.00000000000000 TH 0.00000000
46 AIR
47 CV 0.00000000000000 TH 0.00000000
47 AIR
48 CV 0.00000000000000 TH 80.00000000
48 AIR
49 CV 0.00000000000000 TH 0.24140259
49 AIR
50 CV 0.00000000000000 TH 0.00000000
50 AIR
51 CV 0.00000000000000 TH 0.00000000
51 AIR

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END  
SYNOPSIS AI>

TABLE 1C

RLE

TABLE 2A

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ID PRP 20 VERSION 1.8 USING ASPHERIC
ID1 F/NUM 4.05 BY 4.85, FROM VERSION 1.7
ID2 ASPHERIC PUPIL, ARC FIELD STOP FEATHERED
ID3 ABOUT 19.3 INCHES BETWEEN FIELD CENTER LINES
ID4 122.0 MM. ARC RADIUS. FIELD WIDTH 4X80 MM.
WAVL .3650000 .4040000 .4380000
APS -21
GLOBAL
XPXT
EPUPIL
NOVIG
UNITS MM
OBJ FINITE -0.24140259 2.00000000 40.00000000
REF HEIGHT -0.02500000 2.00002315 -0.03000000 40.00046302
MARGIN 1.270000
BEVEL 0.254001
0 AIR
1 CAO 124.00000000 0.00000000 -122.00000000
1 CAI 120.00000000 0.00000000 -122.00000000
1 CV 0.00000000000000 TH 0.00000000
1 -AIR
2 UAP 4 4
40.10000000 2.10000000
40.10000000 -4.70000000
-40.10000000 -4.70000000
-40.10000000 2.10000000
2 CV 0.00000000000000 TH -136.06343000
2 -AIR
3 RAO 180.00000000 60.00000000 10.00000000 0.00000000
3 CV 0.00000000000000 TH 0.00000000
3 AIR
3 DECEN 0.00000000 0.00000000 0.00000000 200
3 BT -45.00000055 0.00000000 200
3 EFILE EX1 31.270000 31.270000 31.524000 0.000000
3 EFILE EX2 31.270000 31.270000 0.000000
3 EFILE MIRROR -10.000000
4 CV 0.00000000000000 TH 113.83900000
4 AIR
4 DECEN 0.00000000 0.00000000 0.00000000 200
4 BT -45.00000055 0.00000000 200
5 RAO 155.00010000 95.00000000 0.00000000 -5.00000000
5 CV 0.00000000000000 TH 0.00000000
5 -AIR
5 DECEN 0.00000000 0.00000000 0.00000000 200
5 AT 45.00000161 0.00000000 200
5 EFILE EX1 48.770000 48.770000 49.024000 0.000000
5 EFILE EX2 48.770000 48.770000 0.000000
5 EFILE MIRROR 10.000000
6 CV 0.00000000000000 TH 0.00000000
6 -AIR
6 DECEN 0.00000000 0.00000000 0.00000000 200
6 AT 45.00000161 0.00000000 200
7 CV 0.00000000000000 TH 0.00000000
7 -AIR
8 CV 0.00000000000000 TH 0.00000000
8 -AIR
9 CV 0.00000000000000 TH -96.27020000
9 -AIR
10 RAO 190.00020000 130.00000000 0.00000000 -5.00000000
10 CV 0.00000000000000 TH 0.00000000
10 AIR
10 DECEN 0.00000000 0.00000000 0.00000000 200
10 AT -45.00000176 0.00000000 200
10 EFILE EX1 66.270000 66.270000 66.524000 0.000000
10 EFILE EX2 66.270000 66.270000 0.000000
10 EFILE MIRROR -10.000000
11 CV 0.00000000000000 TH 340.18700000
11 AIR
11 DECEN 0.00000000 0.00000000 0.00000000 200

```

11 AT	-45.00000176	0.00000000	200		
12 RAO	255.00000000	170.00000000	0.00000000	122.00000000	
12 CV	-0.0014660357817	TH	-335.38433884		
12 -AIR					
12 DECEN	0.00000000	-122.00000000	0.00000000	200	
12 AT	0.00000000	0.00000000	200		
12 EFILE EX1	86.270000	86.270000	86.524001	0.000000	
12 EFILE EX2	86.270000	86.270000	0.000000		
12 EFILE MIRROR	8.500000				
13 CV	0.00000000000000	TH	0.00000000		
13 -AIR					
14 CV	0.00000000000000	TH	0.00000000		
14 -AIR					
15 CV	0.00000000000000	TH	0.00000000		
15 -AIR					
16 CV	0.00000000000000	TH	0.00000000		
16 -AIR					
17 CV	0.00000000000000	TH	0.00000000		
17 -AIR					
18 CV	0.00000000000000	TH	0.00000000		
18 -AIR					
19 CV	0.00000000000000	TH	0.00000000		
19 -AIR					
19 DECEN	0.00000000	0.00000000	0.00000000	1	
19 GT	-90.00000086	0.00000000	1		
20 CV	0.00000000000000	TH	0.00000000		
20 -AIR					
21 RAD	-384.3771101406386	TH	0.00000000		
21 CC	-0.95921965				
21 AIR					
21 DC1	-1.6015744E-04-3.0107985E-09-3.9049472E-14	1.4301874E-17-2.6293285E-21			
21 DC2	0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00				
21 DC3	0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00				
21 DECEN	0.00000000	0.00000000	0.00000000	99	
21 AT	0.00000000	0.00000000	99		
21 EFILE EX1	49.000000	50.000000	50.000000	0.000000	
21 EFILE EX2	49.000000	49.000000	0.000000		
21 EFILE MIRROR	-12.500000				
22 CV	0.00000000000000	TH	0.00000000		
22 AIR					
22 DECEN	0.00000000	0.00000000	0.00000000	1	
22 AT	0.00000000	0.00000000	1		
23 CV	0.00000000000000	TH	0.00000000		
23 AIR					
24 CV	0.00000000000000	TH	0.00000000		
24 AIR					
25 CV	0.00000000000000	TH	0.00000000		
25 AIR					
26 CV	0.00000000000000	TH	0.00000000		
26 AIR					
27 PTH	-20 1.00000000	0.00000000			
27 CV	0.00000000000000				
27 AIR					
28 PCV	20 1.00000000	0.00000000			
28 PTH	-19 1.00000000	0.00000000			
28 PIN	-19				
28 GID 'PICKUP'					
29 PCV	19 1.00000000	0.00000000			
29 PTH	-18 1.00000000	0.00000000			
29 AIR					
30 PCV	18 1.00000000	0.00000000			
30 PTH	-17 1.00000000	0.00000000			
30 PIN	-17				
30 GID 'PICKUP'					
31 PCV	17 1.00000000	0.00000000			
31 PTH	-16 1.00000000	0.00000000			
31 AIR					
32 PCV	16 1.00000000	0.00000000			
32 PTH	-15 1.00000000	0.00000000			
32 PIN	-15				
32 GID 'PICKUP'					
33 PCV	15 1.00000000	0.00000000			

TABLE 2C

33	PTH	-14	1.00000000	0.00000000		
33	AIR					
34	PCV	14	1.00000000	0.00000000		
34	PTH	-13	1.00000000	0.00000000		
34	PIN	-13				
34	GID	'PICKUP'				
35	PCV	13	1.00000000	0.00000000		
35	PTH	-12	1.00000000	0.00000000		
35	AIR					
36	PCV	12	1.00000000	0.00000000		
36	RAO	255.00000000	170.00000000	0.00000000	-122.00000000	
36	TH	-331.26900000				
36	-AIR					
36	EFILE	EX1	86.270000	86.270000	86.524001	0.000000
36	EFILE	EX2	86.270000	86.270000	0.000000	
36	EFILE	MIRROR	8.500000			
37	RAO	190.00020000	130.00000000	0.00000000	0.00000000	
37	CV	0.00000000000000	TH	0.00000000		
37	AIR					
37	DECEN	0.00000000	-122.00000000	0.00000000	200	
37	AT	-45.00000175	0.00000000	200		
37	EFILE	EX1	66.270000	66.270000	66.524000	0.000000
37	EFILE	EX2	66.270000	66.270000	0.000000	
37	EFILE	MIRROR	-10.000000			
38	CV	0.00000000000000	TH	92.89800000		
38	AIR					
38	DECEN	0.00000000	0.00000000	0.00000000	200	
38	AT	-45.00000175	0.00000000	200		
39	CV	0.00000000000000	TH	0.00000000		
39	AIR					
40	CV	0.00000000000000	TH	182.19200000		
40	AIR					
41	CV	0.00000000000000	TH	0.00000000		
41	AIR					
42	CV	0.00000000000000	TH	0.00000000		
42	AIR					
43	CV	0.00000000000000	TH	0.00000000		
43	AIR					
44	CV	0.00000000000000	TH	0.00000000		
44	AIR					
45	CV	0.00000000000000	TH	80.00000000		
45	AIR					
46	CV	0.00000000000000	TH	-220.69057000		
46	AIR					
47	RAO	169.99965000	95.00000000	0.00000000	-5.00000000	
47	CV	0.00000000000000	TH	0.00000000		
47	-AIR					
47	DECEN	0.00000000	0.00000000	0.00000000	200	
47	AT	-45.00000055	0.00000000	200		
47	EFILE	EX1	48.770000	48.770000	49.024000	0.000000
47	EFILE	EX2	48.770000	48.770000	0.000000	
47	EFILE	MIRROR	10.000000			
48	CV	0.00000000000000	TH	-230.93400000		
48	-AIR					
48	DECEN	0.00000000	0.00000000	0.00000000	200	
48	AT	-45.00000055	0.00000000	200		
49	CV	0.00000000000000	TH	146.06200000		
49	-AIR					
50	RAO	190.00020000	60.00000000	12.50000000	5.30000000E-09	
50	CV	0.00000000000000	TH	0.00000000		
50	AIR					
50	DECEN	0.00000000	0.00000000	0.00000000	200	
50	BT	45.00000052	0.00000000	200		
50	EFILE	EX1	31.270000	31.270000	31.524000	0.000000
50	EFILE	EX2	31.270000	31.270000	0.000000	
50	EFILE	MIRROR	-10.000000			
51	CV	0.00000000000000	TH	136.06343000		
51	AIR					
51	DECEN	0.00000000	0.00000000	0.00000000	200	
51	BT	45.00000052	0.00000000	200		
52	CV	0.00000000000000	TH	0.00000000		
52	AIR					